

Impacts of Air Pollution on Crops in South Asia

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The problem of air pollution has attracted special attention in south Asia due to tremendous increase in size of population, industrialization and urbanization since last few decades. The major air pollutants of concern are identified as sulphur dioxide, nitrogen dioxide, ozone and particulate matter. Thermal power plants and transport sector are the biggest contributor of air pollution in the region.

Air pollution is becoming an important constraint to crop production under current ambient concentrations in many areas of India. Experimental studies conducted at Varanasi situated in upper Gangetic plains of India have indicated significant losses of agricultural production at current ambient pollutant levels in urban, periurban and rural areas. The intensity of losses, however, depends upon the pollutant concentration, duration of exposure, climatic and edaphic factors, plant species and cultivars. Pollutants either affect the plants directly by causing visible injury or indirectly growth or yield reductions without visible injury. Reductions in leaf area, biomass, chlorophyll, ascorbic acid and N contents have often been observed for the crop species growing in polluted area. Field transect studies have shown significant negative correlations between air pollutant concentrations and net photosynthesis, biomass accumulation and yield of crop plants. Monocot plants are found to be more resistant than dicot plants. Leguminous plants and leafy vegetables are most sensitive to air pollutants among the crop plants. Winter crops showed relatively lower magnitude of yield losses at different sites than summer crops. Quality of seeds also varied between urban, periurban and rural sites. Variations in nutrient, metabolite and energy contents of seeds directly corresponded to the levels of air pollutants at different sites. At urban and periurban sites, the magnitude of response involved all pollutants, whereas at rural site ozone had more influence. Ozone seems to play a major role in yield loss as maximum reductions in yield and quality of seeds were recorded at sites showing highest O₃ concentrations. Pollutants in combination modify the response of plants. Simulation experiments conducted in open top chambers have also confirmed the adverse impacts of individual pollutants on plants. National ambient air quality standards are mainly based on health impact, hence a revision of the same taking into account climatic conditions; type of crops and soil is urgently required to save crops from adverse impacts of air pollution. Economic evaluation of crop loss due to air pollution is an important need of the future to secure food for growing population of the region. Long-term studies are required all along the region to identify the high and low risk zones of air pollution to develop control policy for reducing adversities of air pollution on vegetation.